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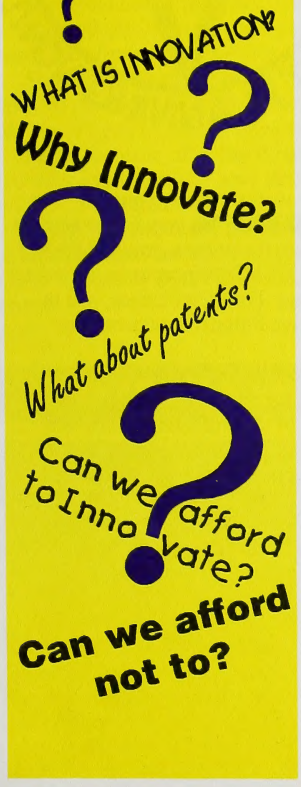
TRANSPORTATION RESEARCH TRANSEARCH

A RESEARCH AND DEVELOPMENT TECHNICAL PUBLICATION

...INSIDE INNOVATION



By Harry Parenteau,
Equipment Supply & Services Branch

What is innovation? Innovation is the process of making improvements, be they large or small. Innovation is doing the same task a better way. Innovation can save money, time, or reduce risk. There are two steps in the process of innovation. Defining the requirement, necessity or problem; formulating the solution, finding a different way of getting things done, or avoiding the problem. Often the most difficult barrier to innovation isn't formulating a solution, but knowing that one is needed. Often we continue doing our job in the same way we always have, just because that's what we're expected to do.

Innovation in action

Why innovate? Innovations that are successful, are used again and again, may save money, or reduce the effort required to perform a task, or make a job safer, or improve the quality of your product, and therefore have a significant value to the department. Some people innovate without thinking, others don't think to innovate, but everyone is capable of innovation. Give 50 Engineers a problem and you'll come up with at least 51 different solutions. If you replace the word "Engineers" in the preceding sentence with "General Foremen", or "Foremen" or "Equipment Operators" it will still be true. (However don't replace "Engineers" with "Managers" without changing the number of solutions!)

Give 50 Engineers a problem and you'll come up with at least 51 different solutions.

When attempting an innovation, know the limits of reasonableness. Never put at risk your safety or the safety of others in the name of innovation. Don't contravene department policies. If you have some concerns, bounce your ideas off a peer, Occupational Health and Safety, or even, heaven forbid, an engineer.

What about patents? There are two rules. First, if you perform an innovation that is patentable, with your employers' resources, during the course of your employment, expect your employer to own the innovation. Second, if you are employed by the crown, and your innovation infringes on someone else's patent, as long as you haven't hired a third party to manufacture or use your innovation, our solicitor perceives that is should not pose a problem.

The process of passing innovations onto others is called Technology Transfer. Our department encourages innovation. Our senior management fully supports the efforts of the Technology Transfer Section of the Research and Development branch. The Equipment Supply and Services branch, through the

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INSIDE - HOT-IN-PLACE RECYCLING ... Paving the road in one pass

About This Publication

The TRANSEARCH publication is prepared by the Research and Development Branch of Alberta Transportation and Utilities. The publication is dedicated to the effective transfer of transportation and utilities related research information and state-of-the art technologies throughout the department. The opinions expressed in the articles in this publication are those of the authors and are not necessarily the official views of Alberta Transportation and Utilities.

In short news and feature articles, TRANSEARCH reports on the most interesting research and technologically significant events concerning the department.

In the interest of providing a vehicle for the effective transfer of technology throughout the department, Research and Development encourages department staff to provide proposals containing unique ideas, innovations or opportunities for research and evaluation which may provide solutions to the various technical needs of the department.

This publication is distributed throughout the department of Alberta Transportation and Utilities. Back issues are catalogued and retained in the department library. Copies of TRANSEARCH are also distributed to other Canadian D.O.T.s as well as Alberta Cities.

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EDITORIAL

1993 R&D Workshop a Success

After the workshop is over, I usually grunt a sigh of relief and thank the guy above that it's over. Or is it? Fortunately or not, it really isn't over - it's just the beginning of the next planning cycle. The day after the event, R&D staff start working on ideas for the next workshop. We usually receive very good feedback from the delegates on how to improve the workshop. Although, we try to implement all suggestions not all are always feasible, but we try! By following this process we seem to improve the quality of the workshop each time.

This year we opened the workshop to delegates from outside of the department. We had representation from most major cities in Alberta as well as from Parks Canada. We also had some visitors from the United States attending (some went to great lengths to get here).

I was glad to hear the positive compliments regarding the workshop from our U.S. friends. Although the premise of ''Technology Transfer'' is the same, the way we go about it is a little different than in the U.S.A. However, there is substantial common ground between our Technology Transfer Program in Alberta and the U.S.A. Local Transportation Assistance Program (LTAP - which is implemented through 50 Technology Transfer Centres, one in every state). Hopefully, in the future, this may foster cooperative initiatives between our department and the States within our geographic region.

Overall, almost everyone involved in the workshop agreed that it is a worthwhile event and that it should continue ... and since I'm the editor, I'm going to take this opportunity to plug the 1994 workshop. If you are interested in participating in the workshop in any way, you should start planning for that now. If you need help, feel free to contact me anytime.

As a final note, I would like to thank everyone who helped make the 1993 workshop a success!

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Line Painting Controller

By Mark Abt, Research & Development Branch

During 1992, a decision was made to refurbish the line painting control system used in our line painting vehicles, in order to overcome problems associated with the operation of the existing control systems used in the vehicles.

Principals involved with this project included: Emrich Hladky - Equipment Supply and Services, involved with upgrade program coordination and tender specification; Mark Abt - Research and Development, involved with electronic design specification, control system operation, control panel layout and environmental tolerance; Bob Fessler, Paint Foreman - Region #2, involved with operator considerations, control system operation, vehicle factors and delivered system acceptance.

The existing line painting control systems were essentially electrically actuated mechanical devices. These devices typically are prone to failure due to component wear and/or harsh environment operation. Downtime caused by the control system failures, and repair turnaround periods, necessitated the replacement of the control system with solid state electronics.

Solid state electronics have the advantage of limited vulnerability to the conditions which can cause a mechanical system to fail. These types of control systems when designed with computer control features, offer the flexibility to be used on dissimilar platforms and can easily have their operating characteristics modified if required.

Design requirements included the reduction of operator workload to allow attention to be focused on quality of product. Ease of service by direct replacement of control module was also desired.

Currently one line painting vehicle has been modified with the new system. This includes two installed controllers (one for each side) and one backup replacement controller. The system has been tested ''dry'' and found to be very satisfactory. Any system tweaking or modifications will be completed when the line painting season begins.

Construction of the Line Painting Control system was performed by Agritronics, 18178-102 Avenue, Edmonton, Alberta, T5S 1S7, (403) 486-5108. Please contact Agritronics regarding purchasing inquires and refer to Model 9220 Line Painting Controller.

Research and Development branch would like to extend their thanks to all the people who helped make this project a success.

...INSIDE INNOVATION *Cont'd from page 1*

Defect and Modification Reporting system, fosters equipment innovations in a direct and positive manner. Working together we may accomplish the impossible.

We're lucky, usually innovators working within a large organization are stifled by management. There is no doubt that innovation takes up valuable time (which could have been used to accomplish your ''real job'' sooner), not to mention other valuable resources like money. Certainly not many of us have a mandate to attempt innovations ''written into'' our job descriptions. The Tech Transfer Reps must serve as a communication network to foster innovation throughout the department.

Fear of failure, lack of resources, lack of support, ridicule by our co-workers. We've all run into these barriers to innovation, but all of these barriers can be overcome. Persevere. Not every visionary is ridiculed by his peers, but more than a few have been. Many people have a problem accepting change. These people are easy to spot. They say things like ''if it's such a good idea, why didn't someone else already think of it?'' Still others view a change as only a change for the sake of change. These people say things like ''we don't have to re-invent the wheel''. Many people do not like new ideas, except their own of course. Large organizations don't tolerate failure well. No one ever tells you about their failures. Sometimes it is easier to beg for forgiveness than it is to get permission, and when faced with the possibility of things going wrong, some innovators go ''underground'' in the hope that no one will find out about their failures. For every innovation that is useful and cost effective, there are an unknown number of unsuccessful ones buried out in the back forty.

If you have an identified equipment performance requirement, necessity or problem, or have developed an equipment innovation, drop me a note, give me a call, send me a picture, and we'll get it published in the Equipment Corner.

Can we afford to innovate? Can we afford not to?

Harry Parenteau
Manager, Equipment Engineering
Equipment Supply and Services Branch
427-8310

Paving the Road in One Pass

By Jim Gavin, Transportation Laboratory

Last fall, travellers in the Barrhead area were taking a double look at the paving operations that they saw on Highway 18 leading to Thunder Lake Provincial Park. What they saw was over a 100 metre long procession of milling, heating and paving machines collectively known as a Hot-In-Place-Recycling (HIPR) operation. This unique construction procedure is able to pre-heat and mill up to 50 mm of asphalt pavement, add rejuvenating agents or fresh mix, and replace the recycled material all in one operation. One benefit of such an operation is the conservation of aggregate and asphalt materials. Reduced construction costs can also be realized, in some instances, compared to conventional plant mixed Recycled Asphalt Concrete Pavement (RACP) through the elimination of the haul of the reclaim material from the road to a central mixing plant and back again.

HOT-IN-PLACE RECYCLING

ARTEC's Hot-In-Place Recycling Operation

Like other agencies in North America, Alberta Transportation and Utilities is faced with the challenge of rehabilitating an aging highway network with reduced budgets. HIPR is one method that shows promise in helping the Department meet this challenge. Other provinces that are regularly using or investigating the use of HIPR are British Columbia and Ontario. In 1992 alone, it is estimated that British Columbia will have used the HIPR process on over 5 million square metres of existing pavement.

The recycling portion of the HIPR train consists of three units. The first two units consist of rows of infrared propane burners for the pre-heating of the pavement surface. At the end of the second unit there is milling head in which, ARTEC claims, up to 65 mm of pavement can be processed in a single pass. On the third unit, rows of upright blades are used to plough through the bed of milled material, thereby continuously providing a ''fresh surface'' of new material to be heated and thus preventing local overheating. In total, the three HIPR units consist of 570 infrared propane burners with each burner putting out approximately 75 000 BTU's of heat.

The treated material is picked up and mixed in a pugmill located at the rear of the third unit. A rejuvenating agent or virgin asphalt cement can be added at this stage to soften up the existing asphalt. The material is then placed in a windrow where it is lifted by a pickup machine and placed in the paver hopper.

Both coated and un-coated aggregate may be added to the process. A hopper on the front of the second unit allows the aggregate to be metered onto the pavement surface prior to milling. An advantage of the ARTEC design over other designs is the ability to add small quantities (up to 10%) of unheated virgin aggregate. In this process, virgin asphalt cement is added to the material at the pugmill stage. By eliminating the need for pre-heating and pre-coating the virgin aggregate, this process

has the potential of being able to modify existing mixes at a lower cost than other HIPR equipment.

A new emissions control system uses an incineration process to reduce the emissions to lower levels. This can be achieved even if a large quantity of crackfiller material is present and the existing pavement is in flushed condition. Experience indicates that emission levels under the Clean Air Act can be met using the new HIPR emissions incineration systems.

Rick Ellwein reported that the Athabasca District was generally pleased with the HIPR process and felt that it's use had potential to increase in the future, considering the dwindling supplies of quality aggregate. Rick was also impressed with the improvement in ride quality provided on this once extremely rough highway.

As part of an evaluation project conducted by Materials Engineering branch (MEB), numerous test sections were constructed incorporating different combinations of mix modifications including the addition of a rejuvenating agent, and different gradations of both coated and un-coated aggregate. In addition to the district's regular materials testing program, an extensive sampling and testing program was coordinated through the Transportation Laboratory. While all laboratory testing has not yet been completed, some general observations have been made. Significantly higher Marshall densities and lower air voids were measured on the HIPR material in comparison to conventional mix design specifications. Mixes with low air voids are cause for concern as they are more prone to asphalt bleeding and permanent deformation, or wheelpath rutting. Whether this performance holds true for HIPR material is still not known but remains a principal topic of investigation within MEB.

Early test results from this evaluation project and other HIPR projects suggests that little age hardening occurs in the recycled asphalt cement due to the HIPR process. Other items currently being investigated by the Transportation Laboratory include; variations in mix properties across the width of the recycled mat, aggregate degradation due to the milling process, ability of rejuvenating agents to soften up the recycled asphalt cement, and the use of admixtures to increase Marshall air voids. A construction report with laboratory test results and analysis is to be completed shortly.

ALBERTA'S HIGHWAYS

Because of its high costs at $2.00 to $2.40/m² (without any admixtures or rejuvenating agents) and questions on its long term performance, HIPR is not expected to routinely replace the use of conventional plant mixed RACP. However, this process has become yet another design alternative to be selected when the project specific economics or circumstances favour its use.

For more information on the HIPR, please contact the author at 427-8053.

PROBLEM CORNER

Inverted rumble strips seem to be working on Highway 16 on the shoulder as seen in the picture. These strips were put in the highway by a steel roller as it was compacting the pavement. Ron Voogel, Equipment Research Technologist from Contracts Engineering branch asked if there is an economical way to get inverted rumble strips in the shoulders of highways that have already been constucted such as along Highway 2?

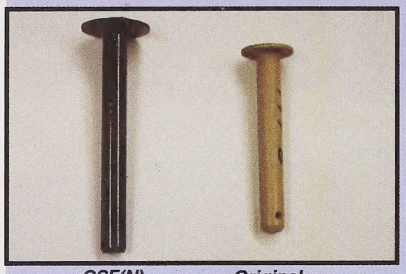
Please send possible solutions and any other commonly recurring (work related) problems to Zach Zacharia c/o Research & Development Branch or phone 422-2750.

Inverted rumble strips on highway 16

Kp. Smith, Assistant District Engineer from Peace River sent in a report on the problems of lumps on the Hopper Sander Grizzly. Terry Colisomo, Resident Engineer from Lac La Biche is presently testing a number of solutions that have been suggested so far. We hope to hear from him in the next issue of Transearch.

In our last issue, no one responded to the problem of bumpy approaches...perhaps this is not a problem!

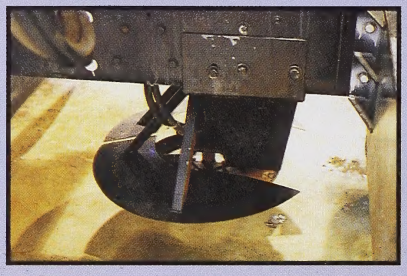
PROBLEMS SOLUTIONS



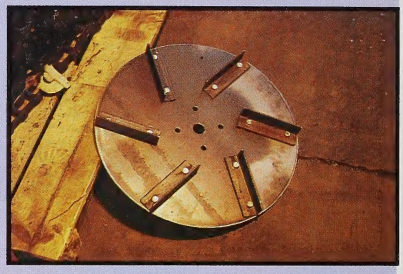
CSF(N) *Original*

The problem: The part in the picture, EMS #21255, is a shear pin for a snow wing on a grader. It costs $63.64 when purchased on a DPO from a ''jobber parts'' store.

The solution: The same part, now being fabricated in the welding shop at CSF(N), and stocked under the same EMS part number, now is available at a cost of $3.92!



The problem: Under certain conditions, when plowing without spreading sand, the steel spinner in the picture builds up with ice. This ice buildup will cause the spinner to vibrate badly, potentially causing damage to the equipment and creating a safety hazard.



The solution now under evaluation: Use a flexible plastic spinner that will resist the build up of ice, preventing the condition.

For any equipment performance requirements, problems or solutions, equipment innovations, please contact Harry Parenteau c/o Equipment, Supply & Services Branch or phone 427-8310.

EQUIPMENT CORNER

Benny Blade Breaking the Ice

IMPROVING TECHNOLOGY

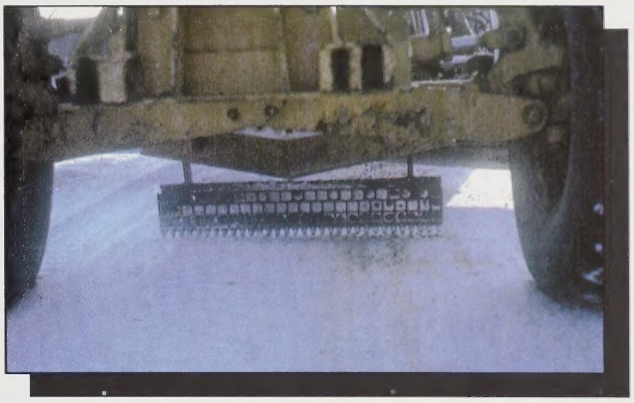
By Darrell Quist, District 15

High Level seems to be into improving graders lately. At the 1992 Technology Transfer Workshop in Grande Prairie, you may recall the best presentation award going to High Level for sharing the idea of a grader gate to eliminate snow windrows. Well, the innovations are continuing with an idea spawned in the mind of equipment operator Ben Fehr, and presented at the 1993 Technology Transfer Workshop in Red Deer.

A condition occurs quite frequently where gravel roads are in generally good condition, but intersections are covered with ice. Those familiar with maintenance know that the Sandvic System 2000 blades are excellent for ice control. However, if used too much on a gravel surfaced road, there is potential for this blade to cause gravel to loosen and be removed from the road. Therefore it should be used sparingly and only when necessary.

Mr. Fehr's development has been labelled the ''Benny Blade''. A four foot length of one-way plow blade set with 32 Sandvic System 2000 teeth is mounted into the scarifier holder in front of the mouldboard. The blade is mounted so that when in contact with the road surface, the teeth are at a 65-degree angle. When required, the blade is lowered hydraulically into position where the teeth rotate and break up ice.

What's good about it? This device eliminates the need to use regular blades on the grader one day, and return the next day with a set of Sandvic blades just to remove ice from the intersections. The device has received interest from the Yukon, Parks Canada, as well as other areas.



The Benny Blade in action

Anyone interested in finding out more should contact Darrell Quist, Assistant District Transportation Engineer in High Level.

Bridge Paint Approval System

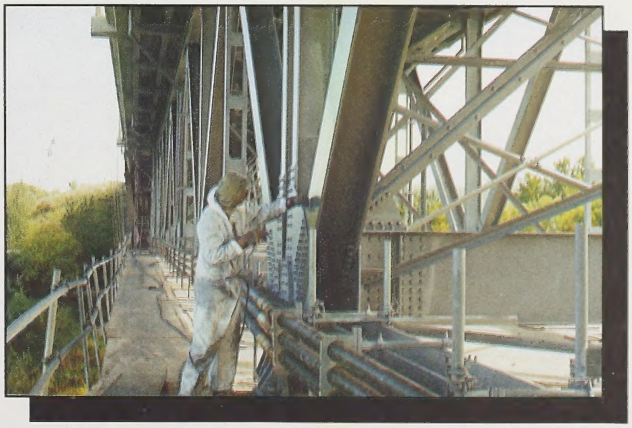
By Paul Carter, Bridge Engineering Branch

Alberta Transportation & Utilities is currently leading a joint venture by 19 government agencies to establish a rational approval system for non-hazardous, environmentally friendly, cost effective paints for bridges. The program is intended to privatize the testing operation, transfer testing costs to the private sector, and develop performance criteria that will stimulate new product development and innovation.

Initially, a well qualified private testing lab was engaged to aid in developing the program. Due to the high testing cost estimates, it was decided to approach some Canadian and American departments of transportation to develop a common market that would have greater appeal to paint manufacturers.

In order to speed up the testing process, new cyclic testing procedures are being used. These involve a test chamber that combines all the usual failure mechanisms into one test that is quicker and more economical than traditional methods. By continuing the test until all products fail, a relative comparison of service life is achieved. User friendliness and the ability of new products to top-coat existing paint systems, thereby reducing high removal costs, are also being evaluated.

Categories of approved products are being designed to enable the specifier to select products to economically fulfil his particular needs. The program was well received by many of the small bridge agencies that lack the manpower and budget resources to develop individual systems. In addition, interest and good technical input is being received from Ontario and California.



Painting Bridges - A Costly Business

And the Winner is...Jack (Spielberg) Stonehouse

1993 R&D Tech Transfer Workshop Award

Jack (Spielberg) Stonehouse did it again! He managed to produce another excellent video for the Technology Transfer Workshop. The video entitled ''Six Pack for the Road'' highlighted six innovations developed or implemented within District 1 - Medicine Hat.

We planned to hand out two awards this year. One for the best "Presentation" (selected by attending delegates). Another entitled "Media Award" for the best packaging of information on an innovation which lends itself to effective tech transfer (selected by discretion of the technology transfer staff at R&D).

Jack came in second place for his 1992 presentation of the ''Road Surface Line Painter'' video only because we had one award to hand out at the time. This year he made up for it by winning both awards.

It would be nice if we could give awards to everyone who gave a presentation at the workshop, especially to an individual like Ben Weiss who is an avid supporter of technology transfer and goes to great lengths in preparing great presentations for the workshop. Thanks Ben, you're a model Tech Transfer Rep!

Jack proudly displays his awards. Congratulations on a job well done!

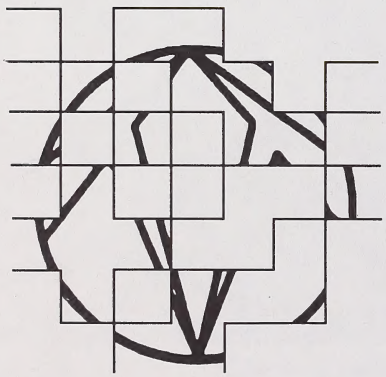
Also, it is well realized that it is hard for some staff, especially field staff, to prepare presentations because they don't have access to fancy equipment for preparing slides, overheads or videos. Because this is so difficult, we would like to convey our sincerest appreciation to Ben Fehr for the effort he put into providing such an excellent presentation on the ''Benny Blade''. If there were four awards, both Bens would certainly each deserve one.

Note - copies of videos presented at the 1993 R&D Technology Transfer Workshop will be distributed to all AT&U and Municipal Tech Transfer Reps. If you would like a copy, please contact the editor.

R & D Publications

ABTR/RD/RR-92/02

Author: Duanyi Wang
Title: **Low Temperature Properties of Asphalt Cements and Mixtures used in the C-SHRP Lamont Test Road in Alberta**
Brief: This report presents the results of a low temperature indirect tensile test program involving 140 asphalt specimens formed with seven different grade and source of asphalt cements, the binder being the only variable.

ABTR/RD/RR-93/01

Author: C.D. Johnston, Ph.D., P.Eng.
Title: **Superplasticizers for Concrete Bridge Construction**
Brief: The primary objective of this project was to determine how the range of superplasticizing and air-entraining admixtures currently available in Alberta can be specified and used to enhance the properties of concretes used in bridge construction.